Iron Bort.

We have been getting occasional pieces of a curious material from the diamond mines, which may prove to have a relation to the mineral described in NATURE of September 7 (J. R. Sutton, "A New Mineral?"), and also may throw some light ultimately upon the origin of the diamond. To outside appearance, in extreme cases, the material has a cindery look; in less extreme cases its diamond affinities are fairly evident. It can be readily disintegrated with a mineralogical file, but it has hard corners which will scratch corundum. The specific gravity is 3·3 to 3·5, *i.e.* slightly lighter than diamond. It is insoluble in acid, is feebly magnetic, and when suspended by a light thread or floated on water (on a cork) shows distinct polarity under the influence of an ordinary large steel horse-shoe magnet. When it is crushed a small bar magnet will readily take up small specks of it. (The mineral previously described in NATURE, by the way, shows no polarity.)

Some months ago I casually examined some pieces of this material, and concluded that they were diamond (bort) with enclosed impurities. Some of the impurity is now proved to be iron, which shows that the statement sometimes made that diamond is not found in association with iron is not quite correct.

Some pieces of this material which had been extracted by the electromagnets at the pulsator were brought in by Mr. Stewart (the manager of the pulsator) a few days ago. They were very unlike the stuff readily recognisable as diamond, but the chain of gradation from these to something more nearly approaching true bort is fairly complete. Whether a diamond buyer would put the same commercial value upon them as he would upon bort is quite another question. Up to the present time I have not come upon any true bort which shows the same magnetic properties. Like true bort, however, this material is a good conductor of electricity.

As a distinctive name for this variety of bort, or iron bort—if bort it may strictly be called—Stewartite would be suitable.

J. R. SUTTON.

Kimberley, September 30.

A Starling's Deception.

THREE weeks ago, or, to be quite correct, on September 22, I was considerably startled and surprised, on going into the garden at 9.30 a.m., at hearing what I thought was a wryneck's call in a tree not many yards off. I listened, and in a few minutes the cry came again clear and distinct as one hears it in the spring and early summer. I was astonished, knowing it to be a rare thing to hear the wryneck after the middle of July. I approached the tree (in which two or three starlings were chattering and whistling) and tried to get a sight of the supposed wryneck, but did not, although the call was repeated several times. I put down my failure to the thickness of the foliage and the ivy-grown trunk, somewhere in the midst of which the bird was doubtless in hiding.

Well, the next morning, and on several days following, the unseasonable, but otherwise very pleasant, note continued to be heard, and always from the same tree and, apparently, in association with the starlings, for I noticed that the cry invariably came after one of the starlings had whistled. The whistle, in fact, seemed to be the signal for the wryneck to sing.

It struck me as being altogether very curious, and I determined to find out, if possible, more about it. So one morning (September 27) I resolved to investigate the matter more closely. Standing under the tree, and after a little patient waiting, I got a starling well into view and watched him carefully. Wagging his head from side to side he chattered and cackled for all he was worth; then came the whistle, and immediately afterwards the wryneck's note, in uttering which I quite distinctly saw the quick movement of the beak. And so the mystery was solved! I waited, hoping to see a repetition of the performance, but the bird, I fancy, caught sight of me and flew away. On two or three of the following days I tried to catch him in the act again, but was not successful. In the early days of October the cry was not heard (at any rate by myself), but it fell on my ear once more, and for the last time, on October 6, and from the same tree.

Starlings are great mimics, I believe, and I am wondering if this particular bird has been reared in the immediate vicinity of a wryneck's nest, and so caught the note from the parent wryneck. However this may be, I thought the incident would interest your readers, and perhaps elicit additional facts of a similar nature from some of them.

I may add that in 1901, from August 19 to September 10, a friend and myself heard almost daily what we firmly believed to be a wryneck's cry. It surprised us, certainly, but, other than being very interested in hearing the unseasonable note, we never investigated the matter properly. The question now arises, were we and the neighbours deceived by a starling in 1901 as I was so nearly deceived by one this autumn?

BASIL T. ROWSWELL.

"Les Blanches," St. Martin's, Guernsey,
October 18.

Hot Days in 1911.

MR. MACDOWALL's dot diagram in NATURE of October 12 certainly shows high correlation between the number of hot days in a quinquennium and the difference between this and the number of hot days in the next quinquennium, and Mr. Corless in NATURE of October 19 finds the value of the correlation coefficient to be $-0{\cdot}725$; but the conclusion is not that the number in one quinquennium is correlated with the number in the next.

If x_1 is the departure from mean value of the number of hot days in one five-year period, and x_2 that in the next succeeding, then, if these are wholly independent variables, sum $x_1x_2=0$, the minus values neutralising the plus, and the coefficient of correlation between x_1 and x_2-x_1, which is

$$\text{sum}\, x_1(x_2-x_1)/\sqrt{\text{sum}\, x_1^2} \times \sqrt{\text{sum}\, (x_2-x_1)^2},$$

becomes

$$-\text{sum}\, x_1^2/\sqrt{\text{sum}\, x_1^2} \times \sqrt{\text{sum}\, (x_2^2+x_1^2)},$$

or $-1/\sqrt{2}$, since sum $x_2^2=$ sum x_1^2 in a long series.

The value $-1/\sqrt{2}$, or $-0{\cdot}707$, is within the limits $-0{\cdot}725 \pm 0{\cdot}059$ given, and the conclusion is that the correlation between successive quinquennia is nil.

This conclusion, based on the figures of Mr. Corless, must render ineffectual Mr. MacDowall's endeavours to make long-range forecasts of weather by correlations at five years' distance, and will disappoint any hopes that the new method may have raised in the minds of "official meteorologists."

H. E. SOPER.

University College, London, October 23.

MR. MACDOWALL, in dealing with the number of "hot" days in a year (NATURE, October 12, p. 485), compares two series of numbers which are not independent, and uses the comparison in an attempt to make seasonal forecasts. His method does not appear to be statistically legitimate. He obtains a series of numbers $N+n_3$, $N+n_1$, ... $N+n_{m-3}$, representing the total number of "hot" days for periods of five years, 1, 2, 3, 4, 5; 2, 3, 4, 5, 6, &c., and plots a diagram showing the relation between $N+n_r$ and $n_{r+5}-n_r$, N being the mean of the five-year totals. If the scales of ordinates and abscissæ were the same, and the series of numbers $N+n_3$, &c., represented a random selection, we should expect to find in the diagram a number of dots distributed more or less symmetrically about a line bisecting externally the angle between the axes. This is what Mr. MacDowall obtains in his diagram on p. 485, allowance being made for his difference of scale. The diagram, as it stands, cannot therefore help the forecaster.

We should expect also to find a large correlation coefficient between $N+n$ and $n_{r+5}-n_r$. For a long series of numbers in which there was ***no correlation*** between $N+n_r$ and $N+n_{+5}$ the value of the coefficient between $N+n_r$, $n_{r+5}-n_r$ would be $-\frac{1}{2}\sqrt{2}$, or $-0{\cdot}71$, say. Mr. Corless finds from Mr. MacDowall's figures a value $-0{\cdot}73$. Clearly, therefore, this cannot be taken to prove periodicity.

The total number of "hot" days in the nine years preceding 1911 is, according to Mr. MacDowall, 586, compared with an average of $9 \times 77=693$, so that unless there

is a variation of very long period or a secular change we must in the next few years experience a preponderance of summers with more than the average number of "hot" days.

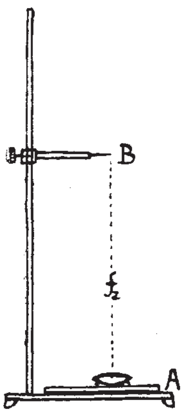
E. GOLD.

Hampstead Garden Suburb, N.W., October 23.

Determination of Refractive Index of a Liquid.

THE following simple method of finding the refractive index of a liquid available in small quantities may be of interest.

A plane mirror A is placed on the base of the stand, and on it is put the double convex lens in such a position that its centre is beneath the needle point B. With the eye directly above B, the observer adjusts the sliding arm until the needle point and its image just coincide, as found by parallax. The distance from B to the centre of the lens is then accurately found—let it be f_1. The experiment is then repeated, after first placing a drop of the liquid upon the mirror, when it will be spread out to a plano-convex lens between the glass lens and the mirror—let the new focal distance be f_2; then evidently the focal length f of the liquid lens will be given by $1/f=1/f_2-1/f_1$.



But since the focal length of the liquid lens is also given by the relation $1/f=(\mu-1)/r$, where r is the radius of curvature of the surface of the glass lens, it is evident that from a knowledge of r the index of refraction of the liquid can be at once found.

If r is not known it can be found by putting a sheet of paper between the lens and mirror, and again obtaining an image of B coincident with itself by reflection in the lower surface of the lens. If this new distance from the lens be called d, we have, since reflection is now only at the upper surface of the lens, $\mu/r-1/d=(\mu-1)/-r$, or $r=(2\mu-1)d$, where μ now, of course, refers to the glass, and can, if necessary, be calculated.

The apparatus is thus complete in itself, and three readings of the position of B give all the data required.

G. N. PINGRIFF.

Market Bosworth Grammar School.

The Nematodes of the Thames.

IN a recent letter to NATURE on the "Ooze of the Thames," I alluded to the number of nematodes which I had observed. I found as I continued my researches at least three different species were present. I have since been working on some ooze from near the Tower Bridge, and again find three different species, some of which are quite distinct from the forms taken at Kew. Thus the two localities yield at least four, if not five, different kinds. They range from about 3 mm. to 20 mm. or more in length. Considering the important part which some of these lowly creatures play in human and animal pathology, it would seem that the Thames mud offers a wide field for investigation. May we hope that this note will direct the attention of London naturalists to a subject of great importance lying close to hand?

Swadlincote. HILDERIC FRIEND.

Miniature Rainbows.

WITH reference to the recent correspondence on miniature rainbows, there is, or was, a most perfect example at the beautiful waterfall known as "Stock Gill Force," situate half a mile outside the little town of Ambleside, near the head of Lake Windermere, County Westmorland.

About five o'clock in the evening is the best time to see it, and, of course, the sun must be shining.

RICHD. COULSON.

4 Waltham Terrace, Blackrock, Co. Dublin, October 15.

Olive Trees.

IN this part of the world when an olive plantation is being made trees of more than 6 inches in diameter in the stem are put in, with all roots cut off short. In the hole where they are planted about two handfuls of barley are also put in.

Considering the age of the trees and the way the roots are cut away, it would seem impossible that the tree would ever grow.

These facts may be of interest; and I should like to know what useful purpose is served by the barley.

Smyrna, Asia Minor. DORA BARFIELD.

EXPLOSIVES ON BOARD BATTLESHIPS.

SOME people have been tempted of late to look back to the old days when black powder held its sway, indifferent to the effects of temperature, and always to be trusted so long as it was kept dry. "Villainous saltpetre" it was called, with a rough affection, and after storing it on shore in magazines plumed with lightning conductors, or comfortably near the boilers on board ship, we never gave it a thought until it was fed, in its flannel bag, into the gun. Then came armour and the long and hard contested duel between protection and penetration. The velocity of the projectile had to be increased. The old black powder, treat it as we would, could only deliver its rather clumsy blow which, while it imparted but a low velocity to the shell, gave an unpleasant, percussive strain to the gun. It was a push that these heavier projectiles required, not a blow.

This state of things led to the introduction of slow-burning powders, and they progressed very slowly. First, the size of grain of black powder was increased until it attained the dimensions of a two-inch cube. The improvement, however, was slight, and the internal stresses on the bore of the gun were still too great. The next step towards real progress was the introduction of what was known as cocoa, or brown powder, in which materials other than dogwood or alder furnished the carbon. This had but a short reign, its place being taken by various propellants which were frankly chemical compounds. To give a list of all this class of propellant, with which experiments and lengthy trials have been carried out with more or less success, would be far beyond the scope of this article; but the interest of the scientific world gradually focussed itself on compounds having nitro-cellulose as their chief constituent, especially after the wonderful discovery that two high explosives, gun-cotton and nitroglycerine, when chemically compounded, tamed and restrained each other, so that a propellant resulted of which the speed of burning could be regulated at will by increasing or diminishing the size of the grain or cord, and also by adjusting the proportions of its constituents. Thus came to man's hand a propellant which far outstripped black powder even in its improved forms, and threw into shade the cocoa powder which, after all, remained in the category to which the French artillerists contemptuously alluded as *poudre brutale*.

"Now," triumphantly exclaimed the gunmakers, "here is a propellant which will enable us to increase the striking velocity of our armour-piercing projectiles, and also to flatten our trajectories to an extent never before contemplated. The cemented steel plates will no longer confer invulnerability on the battleship, and our chances of hitting her will be vastly enhanced." So, to suit the new powders, guns were lengthened and charges increased, and the muzzle velocities rose by leaps and bounds, while the destructive stresses on chamber and bore were minimised by the employment of a propellant the characteristics